Lowell Observatory

STATUS REPORT NO. 1

UNPUBLISHED PRELIMINARY DATA

NGR-03-003-003

RESEARCH ON THE MEASUREMENT OF THE DENSITY OF THE MARTIAN ATMOSPHERE

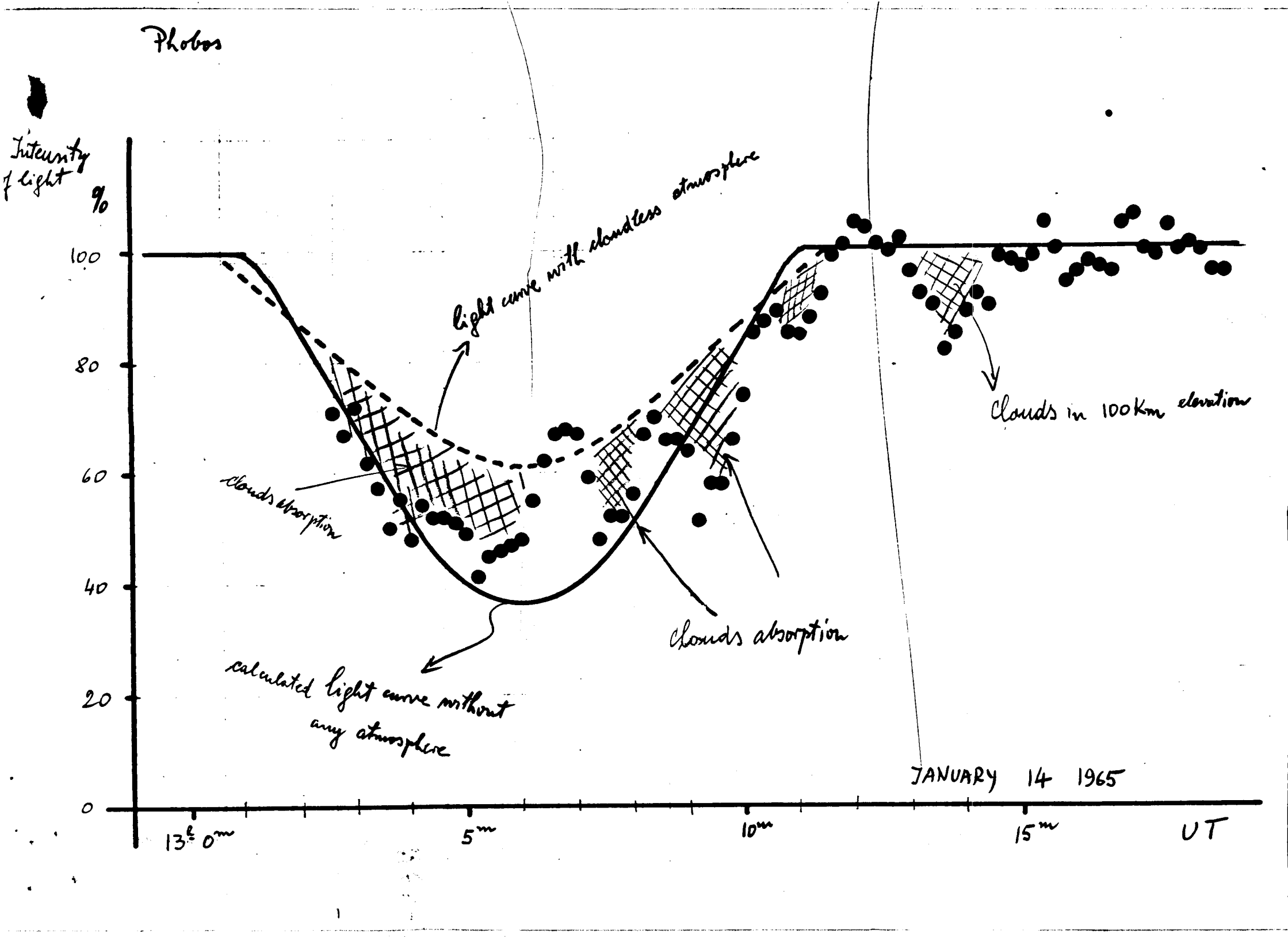
September 1, 1964 to February 28, 1965

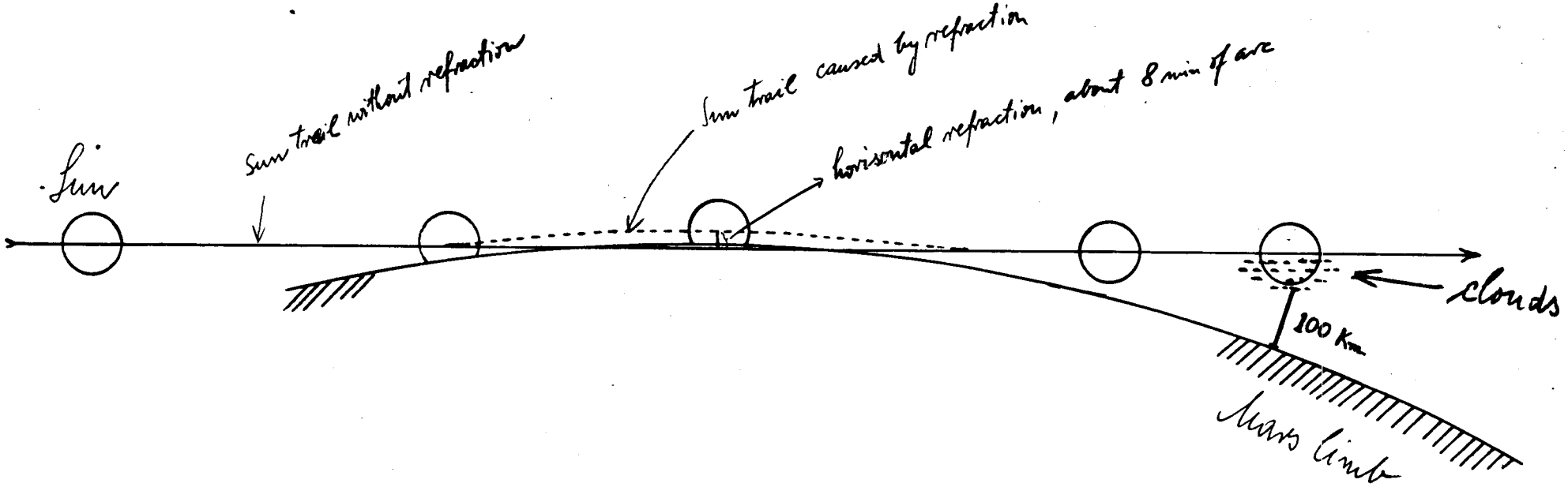
Dr. Rakos spent a considerable amount of time during the summer and fall of 1964 in designing and supervising the construction of the area-scanner. He arrived in the United States with this device on December 27, 1964 and used it for observations of Phobos. The Navy's 61-inch reflector was used for the Phobos observations and also for testing the value of the equipment for other types of astronomical observation. He left the United States at the end of January taking with him 144,000 observations of Phobos. These he has partially reduced and the very preliminary results obtained to date are outlined in his letter to me of 20 March, 1965. Copies of this letter and its accompanying diagrams are enclosed.

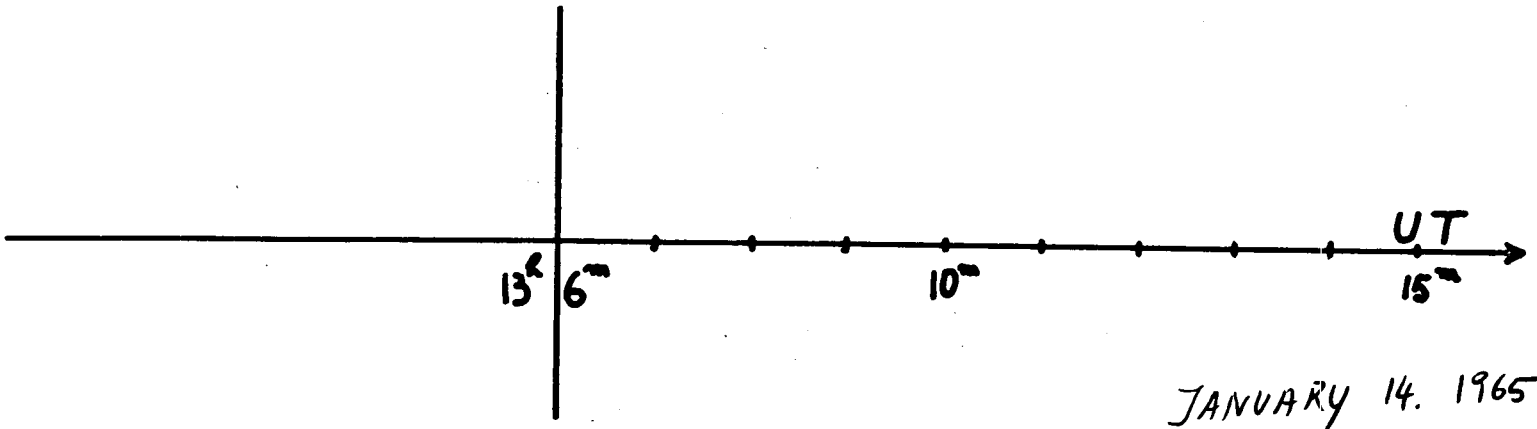
The equipment which he has developed to solve this problem operates extremely well and opens up a new field of photoelectric photometry. As a result, a paper describing the equipment and its use in astronomical problems has been submitted and accepted for publication by Applied Optics. A copy of the manuscript has been forwarded to Dr. William Brunk in the Lunar and Planetary Section of the OSSA.

We believe that useful information regarding the Martian atmosphere will evolve from this project.

John S. Hall
Principal Investigator


Phobos
Intensity of light
%
100
80
60
40
20
0
light curve with cloudless atmosphere
clouds absorption
clouds absorption
calculated light curve without any atmosphere
clouds in 100 km elevation
JANUARY 14 1965
13h 0m
5m
10m
15m
UT





JANUARY 14. 1965

Graz, 20. March 1965.

Dr. John S. H a l l
Lowell Observatory
F L A G S T A F F
Arizona

Dear John ! ... I quit !

In the meantime I made very good progress in the reductions of Phobos observations. Two nights, 11. and 14. January, are very useful for results. Very special is the night of 14. January. The eclipse was only partial and the difference between the light curve calculated and observed is very convenient for estimations of density of the atmosphere. At 13^h06^m UT the center of the sun was two minutes of arc or little more behind of Martian disc. By the horizontal refraction of eight or more minutes of arc, the sun disc was "moved upwards". This effect increases the brightnes of Phobos much more then the loss of light caused by the extinction and other effects in the atmosphere. Very roughly this means that the presure of the atmosphere should be more then hundread millibar on Mars surface. The exact position of sun center, I hope, I can calculate from the night on 11. January.

Also the night on 14. January shows a very interesting absorption at 13^h14^m. If real, it is caused by clouds in very high altitude, more than hundred kilometers above the surface of Mars.

By assumption we have during all observations a continous absorption caused by clouds, or somethings like that, the calculated presure on the surface from the amount of refraction will be always the down limit. By estimation of preasure by extinction in the atmosphere, the result will be always the upper limit. I hope in about one month I can send you the final results.

With best regards, sincerely yours

Karl